IEM's AI Modeling: Short-term COVID-19 Projections

Date: 4/9/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 4/9/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

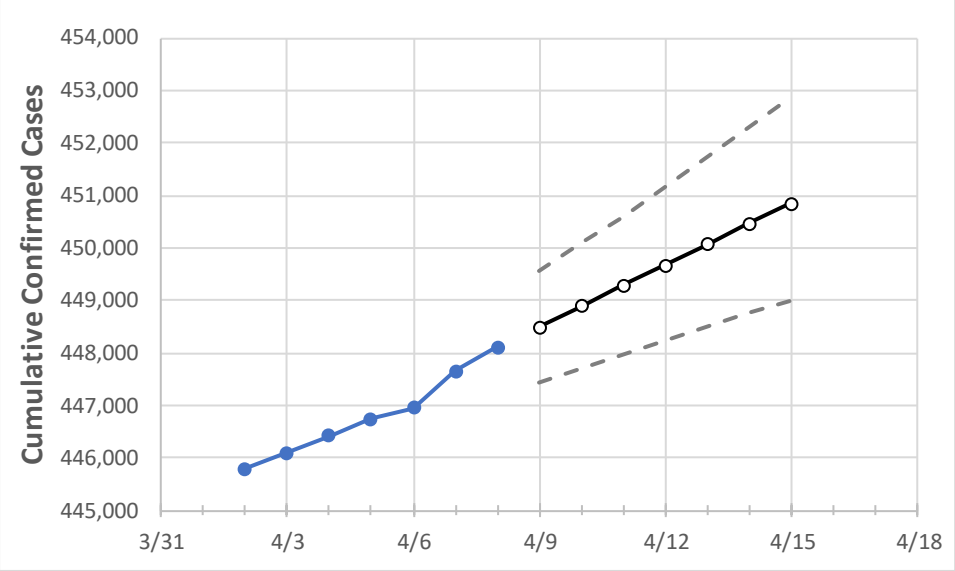
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Louisiana State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15
Louisiana	446,737	446,955	447,655	448,104	448,497	448,886	449,283	449,671	450,066	450,456	450,852

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15
Ascension Parish	11,611	11,617	11,649	11,649	11,660	11,672	11,682	11,693	11,704	11,714	11,723
Bossier Parish	13,304	13,303	13,385	13,400	13,423	13,447	13,475	13,502	13,531	13,563	13,595
Caddo Parish	25,195	25,209	25,246	25,269	25,286	25,304	25,323	25,342	25,361	25,381	25,401
Calcasieu Parish	21,441	21,477	21,512	21,564	21,604	21,643	21,683	21,722	21,761	21,798	21,835
East Baton Rouge Parish	37,581	37,641	37,701	37,716	37,757	37,797	37,836	37,875	37,914	37,952	37,990
Jefferson Parish	45,157	45,173	45,196	45,236	45,258	45,279	45,301	45,322	45,343	45,363	45,383
Lafayette Parish	22,409	22,416	22,448	22,458	22,477	22,497	22,516	22,534	22,554	22,573	22,592
Lafourche Parish	9,381	9,391	9,400	9,401	9,405	9,409	9,413	9,416	9,420	9,424	9,427
Orleans Parish	29,377	29,388	29,396	29,438	29,460	29,483	29,505	29,528	29,552	29,575	29,598
Ouachita Parish	17,928	17,924	17,945	17,947	17,956	17,964	17,974	17,982	17,991	18,000	18,010
Rapides Parish	11,645	11,656	11,681	11,689	11,703	11,718	11,734	11,750	11,767	11,786	11,804
St. Bernard Parish	3,941	3,948	3,955	3,957	3,959	3,961	3,964	3,966	3,968	3,970	3,971
St. Charles Parish	5,304	5,306	5,318	5,317	5,321	5,324	5,328	5,331	5,335	5,338	5,341
St. James Parish	1,912	1,907	1,915	1,915	1,919	1,924	1,928	1,933	1,939	1,945	1,950
St. John the Baptist Parish	3,623	3,625	3,626	3,631	3,633	3,635	3,637	3,640	3,642	3,644	3,646
St. Tammany Parish	25,081	25,097	25,111	25,131	25,143	25,155	25,166	25,176	25,186	25,196	25,206

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- *Beds: For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report (MMWR, March 18, 2020) and state reports of COVID-19 cases.*
- *ICU: The CDC report found that 24% of hospitalized cases require ICU care.*
- *Ventilators: Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.*

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

*The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.*

Louisiana Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	4/5	4/6	4/7	4/8	4/10	4/12	4/14
Ascension Parish	11,611	11,617	11,649	11,649	11,672 (2,334) [560] {280}	11,693 (2,339) [561] {281}	11,714 (2,343) [562] {281}
Bossier Parish	13,304	13,303	13,385	13,400	13,447 (2,689) [645] {323}	13,502 (2,700) [648] {324}	13,563 (2,713) [651] {326}
Caddo Parish	25,195	25,209	25,246	25,269	25,304 (5,061) [1,215] {607}	25,342 (5,068) [1,216] {608}	25,381 (5,076) [1,218] {609}
Calcasieu Parish	21,441	21,477	21,512	21,564	21,643 (4,329) [1,039] {519}	21,722 (4,344) [1,043] {521}	21,798 (4,360) [1,046] {523}
East Baton Rouge Parish	37,581	37,641	37,701	37,716	37,797 (7,559) [1,814] {907}	37,875 (7,575) [1,818] {909}	37,952 (7,590) [1,822] {911}
Jefferson Parish	45,157	45,173	45,196	45,236	45,279 (9,056) [2,173] {1,087}	45,322 (9,064) [2,175] {1,088}	45,363 (9,073) [2,177] {1,089}
Lafayette Parish	22,409	22,416	22,448	22,458	22,497 (4,499) [1,080] {540}	22,534 (4,507) [1,082] {541}	22,573 (4,515) [1,083] {542}
Lafourche Parish	9,381	9,391	9,400	9,401	9,409 (1,882) [452] {226}	9,416 (1,883) [452] {226}	9,424 (1,885) [452] {226}
Orleans Parish	29,377	29,388	29,396	29,438	29,483 (5,897) [1,415] {708}	29,528 (5,906) [1,417] {709}	29,575 (5,915) [1,420] {710}
Ouachita Parish	17,928	17,924	17,945	17,947	17,964 (3,593) [862] {431}	17,982 (3,596) [863] {432}	18,000 (3,600) [864] {432}
Rapides Parish	11,645	11,656	11,681	11,689	11,718 (2,344) [562] {281}	11,750 (2,350) [564] {282}	11,786 (2,357) [566] {283}
St. Bernard Parish	3,941	3,948	3,955	3,957	3,961 (792) [190] {95}	3,966 (793) [190] {95}	3,970 (794) [191] {95}
St. Charles Parish	5,304	5,306	5,318	5,317	5,324 (1,065) [256] {128}	5,331 (1,066) [256] {128}	5,338 (1,068) [256] {128}
St. James Parish	1,912	1,907	1,915	1,915	1,924 (385) [92] {46}	1,933 (387) [93] {46}	1,945 (389) [93] {47}
St. John the Baptist Parish	3,623	3,625	3,626	3,631	3,635 (727) [174] {87}	3,640 (728) [175] {87}	3,644 (729) [175] {87}
St. Tammany Parish	25,081	25,097	25,111	25,131	25,155 (5,031) [1,207] {604}	25,176 (5,035) [1,208] {604}	25,196 (5,039) [1,209] {605}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.